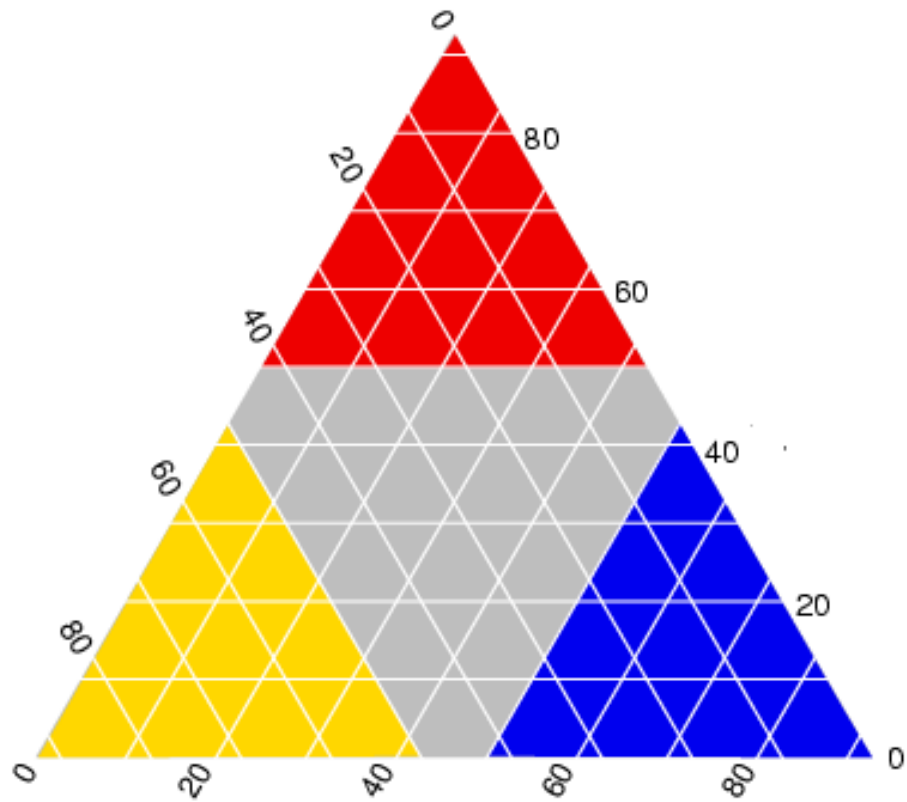


PROPORTIONS



Presented by Ed D'Souza, Ph.D.

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Mapping of Standards That Use Proportions

Grade 6
NS1.2* Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations (a/b , a to b , $a:b$).
NS1.3* Use proportions to solve problems (e.g., determine the value of N if $4/7 = N/21$, find the length of a side of a polygon similar to a known polygon). Use cross-multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.
NS1.4* Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.
AF2.1 Convert one unit of measurement to another (e.g., from feet to miles, from centimeters to inches).
AF2.2* Demonstrate an understanding that <i>rate</i> is a measure of one quantity per unit value of another quantity.
AF2.3 Solve problems involving rates, average speed, distance, and time.

Grade 7
NS1.6 Calculate the percentage of increases and decreases of a quantity.
NS1.7* Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.
AF3.4* Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.
AF4.2* Solve multistep problems involving rate, average speed, distance, and time or a direct variation.
MG1.1 Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters)
MG1.2 Construct and read drawings and models made to scale.
MG1.3* Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.

Algebra I
15.0* Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.
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Definitions

Ratio: is a unit-less quantity and compares like amounts. Dollars to dollars, miles to miles, kilograms to kilograms, number of people to number of people. It is expressed as a fraction.

Rate: is a ratio which does not compare two like quantities. For example 5 miles/ hour compares 5 miles traveled in 1 hour.

A Proportion is an equation that compares two ratios. $\frac{3}{5} = \frac{x}{10}$

Common Method to Be Used- The Proportion Tool

A proportion tool is a graphic organizer where the top part of the tool is for the first quantity being compared and the bottom part of the tool is for the second quantity it is being compared to. By using the natural patterns discovered in the table one can determine the unknown amount.

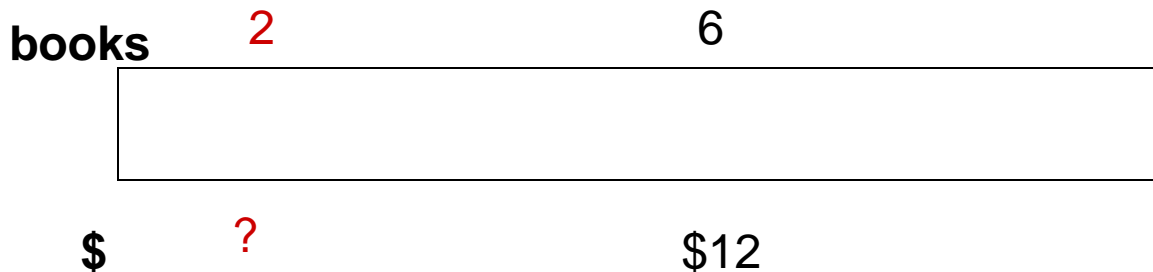
For example 6 books cost \$12, what will 2 books cost

Step 1: What two things are being compared here?

Books and dollars (\$)

Step 2: Draw your proportion bar, clearly labeling where the book info is kept and the \$ info is kept.

Note we put the info first that relates books to dollars, Here 6 books cost \$12. Looking at the other info., we have to determine the price of 2 books, so that info goes below 6.



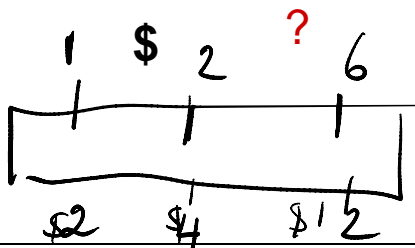
How would you solve this? Talk to the person next to you.

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books

2

6



Method 1

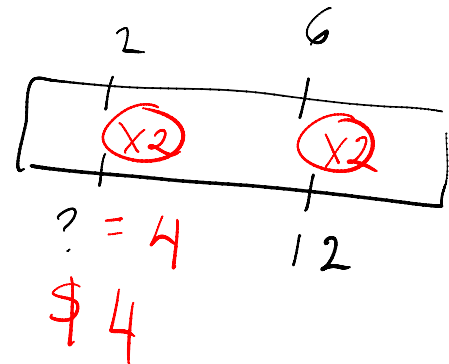
6 books cost \$12

So 1 book costs \$2

And 2 books cost double that amount

or $2 \times \$2 = \4

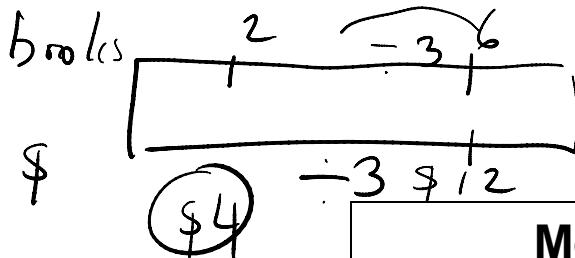
\$12



Method 2

6 multiplied by 2 = 12

So 2 has to be multiplied by 2 to determine the cost of 2 books or \$4.



Method 3

6 divided by 3 = 2

So 12 divided by 3 = \$4

Let's see how this tool can be applied to ALL problem types on the standards listed previously.

Sixth grade Problem Types

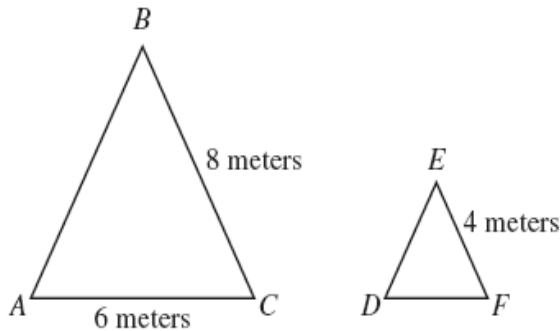
- 6** The weekly milk order for the Tranquility Inn includes 40 gallons of low-fat milk and 15 gallons of chocolate milk. What is the ratio of the number of low-fat gallons to chocolate gallons in the Tranquility Inn's weekly milk order?

A 3:1
B 5:1
C 5:3
D 8:3

- 9** A certain map uses a scale of 1 inch equals 25 miles. How many miles are represented by 5 inches on this map?

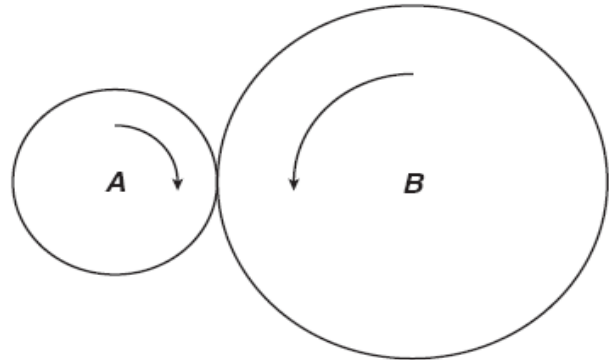
A 5
B 25
C 50
D 125

- 7** $\triangle ABC$ is similar to $\triangle DEF$. What is the length of \overline{DF} ?



A 2 meters
B 3 meters
C 5 meters
D 10 meters

- 10** When wheel B turns 2 revolutions, wheel A turns 5 revolutions. When wheel A turns 40 revolutions, how many revolutions does wheel B turn?



A 4
B 16
C 80
D 100

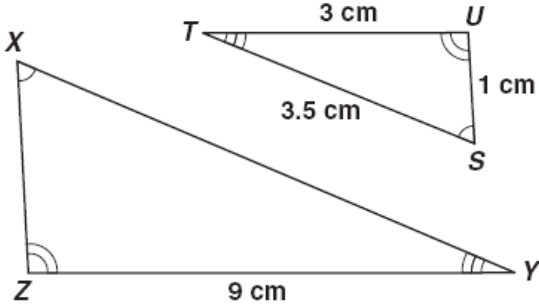
- 8** A farmer harvested 14,000 pounds of almonds from an 8-acre orchard. Which proportion could be solved to find x , the expected harvest from a 30-acre orchard?

A $\frac{8}{14,000} = \frac{x}{30}$
B $\frac{8}{14,000} = \frac{30}{x}$
C $\frac{30}{14,000} = \frac{x}{8}$
D $\frac{30}{14,000} = \frac{8}{x}$

- 11** A company makes 5 blue cars for every 3 white cars it makes. If the company makes 15 white cars in one day, how many blue cars will it make?

A 9
B 13
C 17
D 25

Sixth grade Problem Types (Cont'd.)

<p>13 A survey of 1000 registered voters revealed that 450 people would vote for candidate A in an upcoming election. If 220,000 people vote in the election, how many votes would the survey takers predict candidate A should receive?</p> <p>A 44,500 B 48,900 C 95,000 D 99,000</p>	<p>16 Miranda enlarged a picture proportionally. Her original picture is 4 cm wide and 6 cm long. If the new, larger picture is 10 cm wide, what is its length?</p> <p>A 8 cm B 12 cm C 15 cm D 20 cm</p>
<p>14 If $\triangle XYZ$ is similar to $\triangle STU$, what is the length of \overline{XY} in centimeters?</p>  <p>A 9 B 10.5 C 12 D 12.5</p> <p style="text-align: right; font-size: small;">CSM21684</p>	<p>17 The practice range at a golf course charges \$4.00 for a bucket of 40 golf balls. At this rate, how much will a bucket of 100 golf balls cost?</p> <p>A \$10.00 B \$10.50 C \$13.50 D \$16.00</p> <p>18 The vice president of sales took a client out to lunch. If the lunch was \$44 and she gave a 20% tip, how much money did she spend on lunch?</p> <p>A \$8.80 B \$35.20 C \$52.80 D \$53.80</p>
<p>15 A model of a park was built on a scale of 1.5 centimeters to 50 meters. If the distance between two trees in the park is 150 meters, what is this distance on the model?</p> <p>A 0.5 centimeter B 4.5 centimeters C 75 centimeters D 225 centimeters</p>	<p>19 If 50% of a number is 20, what is 75% of the number?</p> <p>A 8 B 15 C 30 D 45</p> <p>20 What is 60% of 30?</p> <p>A 1.8 B 18 C 180 D 1800</p> <p>21 The original price of a new bicycle is \$138.00. If the bicycle is marked down 15%, what is the new price?</p> <p>A \$20.70 B \$117.30 C \$123.00 D \$153.00</p>

- 6 The weekly milk order for the Tranquility Inn includes 40 gallons of low-fat milk and 15 gallons of chocolate milk. What is the ratio of the number of low-fat gallons to chocolate gallons in the Tranquility Inn's weekly milk order?

A 3:1
B 5:1
C 5:3
D 8:3

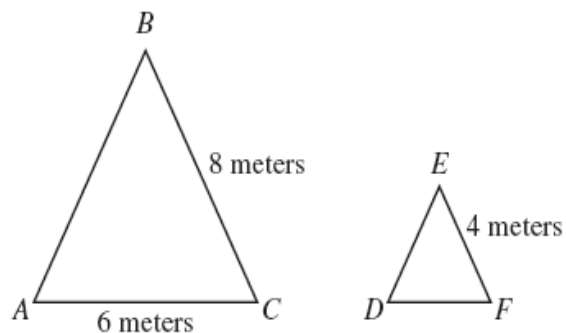
low-fat milk, choc milk

low fat 40

choc milk 15

Ratio $\frac{40}{15} = \left(\frac{8}{3}\right)$

- 7 $\triangle ABC$ is similar to $\triangle DEF$. What is the length of \overline{DF} ?



A 2 meters
B 3 meters
C 5 meters
D 10 meters

small \triangle , big \triangle

Small \triangle 4

big \triangle 8

$\times 2$

$\textcircled{?} \times 2 = 6$ $\textcircled{?} = 3 \text{ m}$

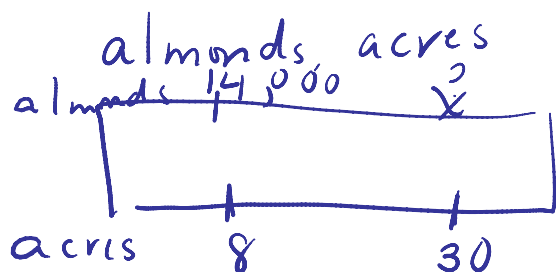
- 8 A farmer harvested 14,000 pounds of almonds from an 8-acre orchard. Which proportion could be solved to find x , the expected harvest from a 30-acre orchard?

A $\frac{8}{14,000} = \frac{x}{30}$

B $\frac{8}{14,000} = \frac{30}{x}$

C $\frac{30}{14,000} = \frac{x}{8}$

D $\frac{30}{14,000} = \frac{8}{x}$



If 8 is in num, can't be A
Has to be B

$$\frac{8}{14,000} = \frac{30}{x}$$

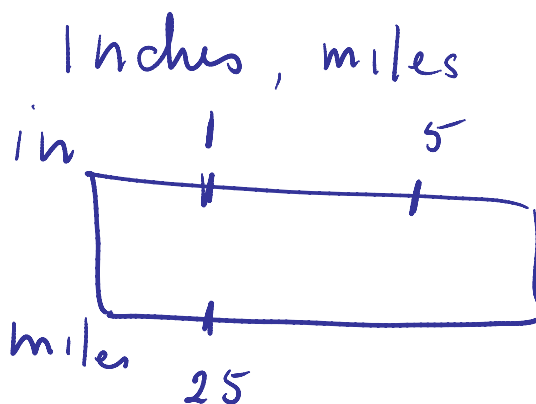
- 9 A certain map uses a scale of 1 inch equals 25 miles. How many miles are represented by 5 inches on this map?

A 5

B 25

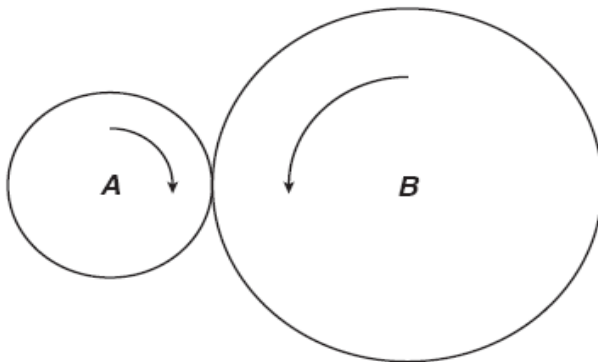
C 50

D 125

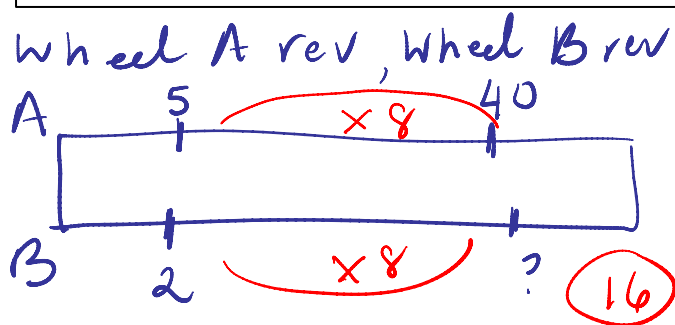


1 - 25		4 in = 100 miles
2 - 50		+ 1 in = 25 miles
4 - 100		<hr/> 5 in 125 miles

- 10 When wheel *B* turns 2 revolutions, wheel *A* turns 5 revolutions. When wheel *A* turns 40 revolutions, how many revolutions does wheel *B* turn?

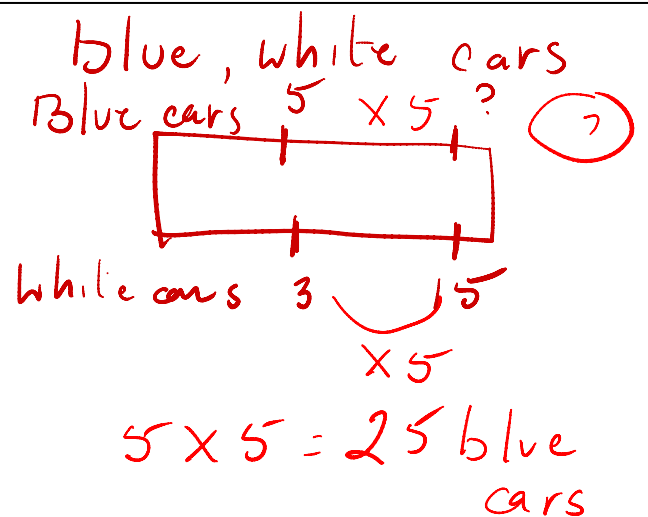


- A 4
B 16
C 80
D 100



- 11 A company makes 5 blue cars for every 3 white cars it makes. If the company makes 15 white cars in one day, how many blue cars will it make?

- A 9
B 13
C 17
D 25

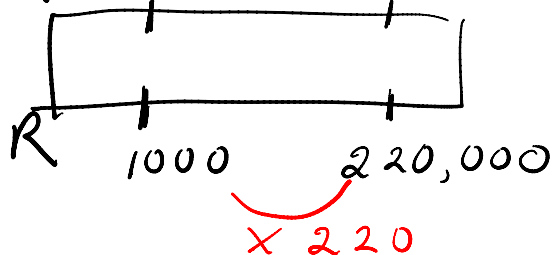


- 13 A survey of 1000 registered voters revealed that 450 people would vote for candidate A in an upcoming election. If 220,000 people vote in the election, how many votes would the survey takers predict candidate A should receive?

A 44,500
B 48,900
C 95,000
D 99,000

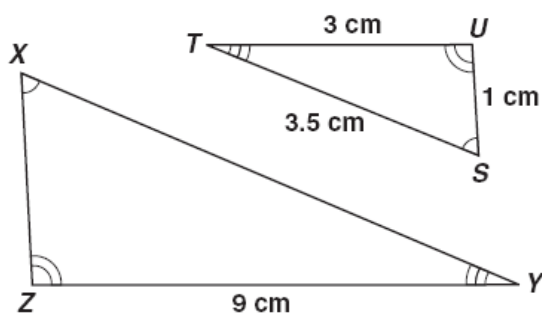
Registered voters = R
Voters for cand A = A

A 450 \times 220?



Can clearly see from answers it has to be D

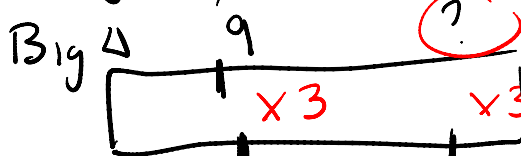
- 14 If $\triangle XYZ$ is similar to $\triangle STU$, what is the length of \overline{XY} in centimeters?



A 9
B 10.5
C 12
D 12.5

CSM21684

Big Δ , Small Δ

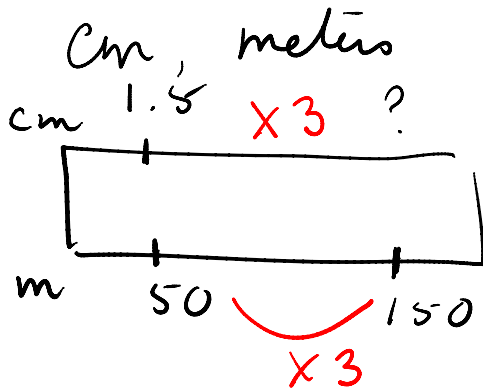


Small Δ 3 3.5

$$\overline{XY} = 3.5 \times 3 = 10.5 \text{ cm}$$

15 A model of a park was built on a scale of 1.5 centimeters to 50 meters. If the distance between two trees in the park is 150 meters, what is this distance on the model?

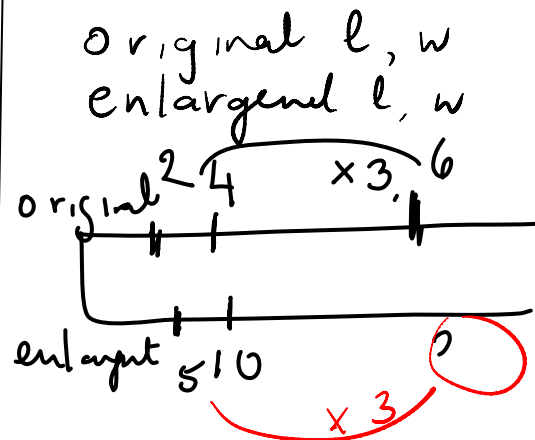
- A 0.5 centimeter
- B 4.5 centimeters
- C 75 centimeters
- D 225 centimeters



$$1.5 \times 3 = 4.5 \text{ cm}$$

16 Miranda enlarged a picture proportionally. Her original picture is 4 cm wide and 6 cm long. If the new, larger picture is 10 cm wide, what is its length?

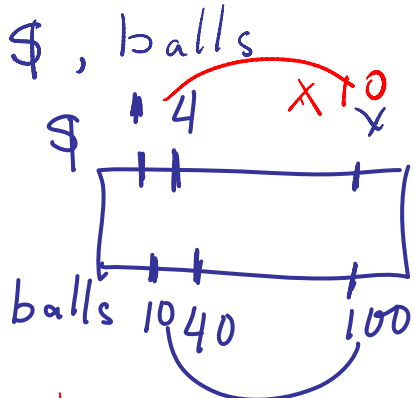
- A 8 cm
- B 12 cm
- C 15 cm
- D 20 cm



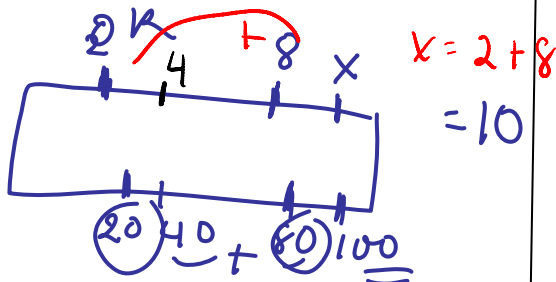
$$5 \times 3 = 15 \text{ cm}$$

- 17 The practice range at a golf course charges \$4.00 for a bucket of 40 golf balls. At this rate, how much will a bucket of 100 golf balls cost?

A \$10.00
B \$10.50
C \$13.50
D \$16.00

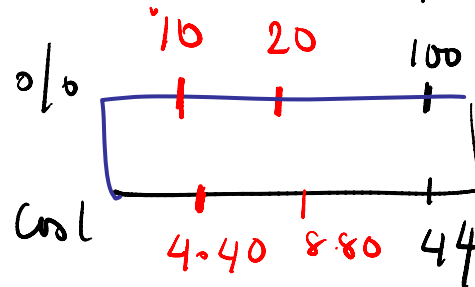
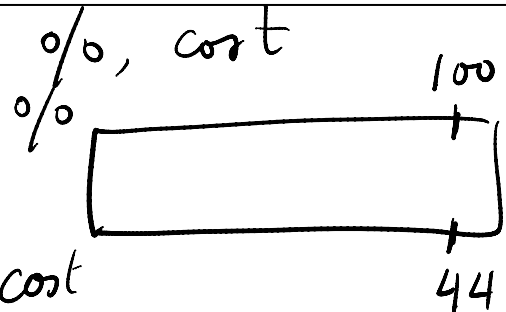


charge = $1 \times 10 = \$10$



- 18 The vice president of sales took a client out to lunch. If the lunch was \$44 and she gave a 20% tip, how much money did she spend on lunch?

A \$8.80
B \$35.20
C \$52.80
D \$53.80



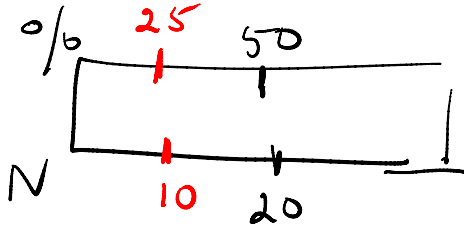
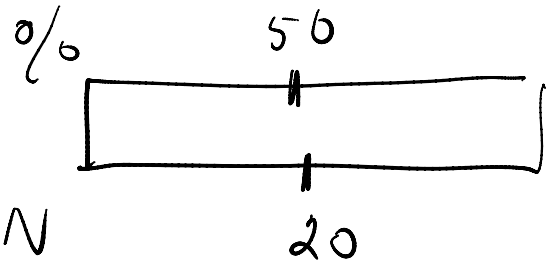
So he paid = \$44

$$+ 8.80$$

$$\hline \$52.80$$

19 If 50% of a number is 20, what is 75% of the number?

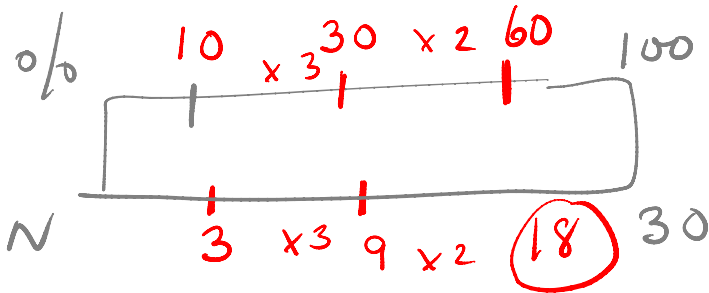
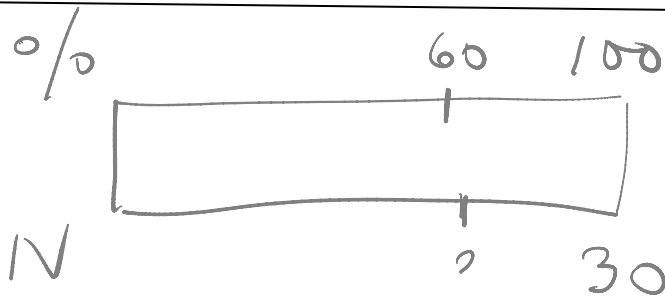
- A 8
- B 15
- C 30
- D 45



$$\begin{array}{rcl} 50\% & = & 20 \\ +25\% & = & +10 \\ \hline 75\% & = & 30 \end{array}$$

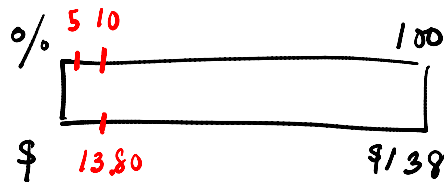
20 What is 60% of 30?

- A 1.8
- B 18
- C 180
- D 1800



21 The original price of a new bicycle is \$138.00. If the bicycle is marked down 15%, what is the new price?

- A \$20.70
- B \$117.30
- C \$123.00
- D \$153.00



$$\begin{array}{rcl} 5\% & = & 13.80 \div 2 = \$6.90 \\ 10\% & = & \$13.80 \\ 15\% & = & \$20.70 \end{array}$$

$$\begin{array}{r} \text{New price} \\ \$138 \\ -20.70 \\ \hline \$117.30 \end{array}$$

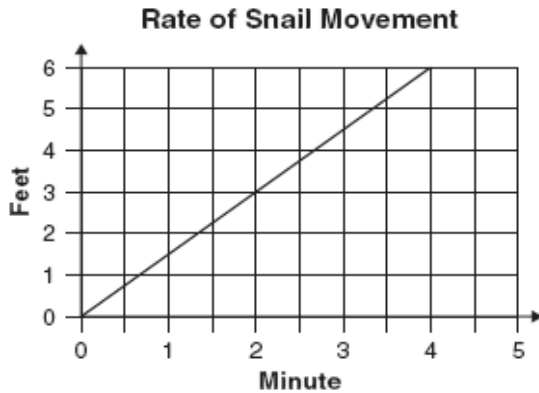
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Sixth grade Problem Types- Algebra & Functions

<p>51 How many inches are in $2\frac{1}{2}$ feet?</p> <p>A 24 inches B 25 inches C 29 inches D 30 inches</p>	<p>55 Marcus spent \$3.25 to wash his car. If one quarter operates the car wash for 60 seconds, how long did it take him to wash his car?</p> <p>A 10 minutes B 13 minutes C 16 minutes D 32.5 minutes</p>
<p>52 Sandra had a recipe that required $\frac{1}{3}$ pound of beef.</p> <p style="text-align: center;">Pound Equivalent</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">1 pound = 453.6 grams</div> <p>Using the table above, about how many grams of beef does she need?</p> <p>A 5 B 151 C 454 D 1361</p>	<p>56 A car gets 24 miles per gallon of gasoline (mi/gal). How many gallons of gasoline would the car need to travel 144 miles?</p> <p>A 6.5 gallons B 6 gallons C 5.5 gallons D 5 gallons</p>
<p>53 It takes a machine 12 minutes to fill 200 bottles of soda. At this rate, how many minutes will it take the machine to fill 500 bottles of soda?</p> <p>A 25 minutes B 28 minutes C 30 minutes D 40 minutes</p>	<p>57 Sheila has been given 5 minutes to solve 20 arithmetic problems. What is the minimum rate Sheila can work in order to finish in time?</p> <p>A 1 problem per minute B 2 problems per minute C 4 problems per minute D 5 problems per minute</p>
<p>54 Trish's resting heart rate is 50 beats per minute. For every minute she exercises, her heart rate increases 5 beats per minute. How long will it take her to reach a heart rate of 120 beats per minute?</p> <p>A 5 minutes B 14 minutes C 34 minutes D 70 minutes</p>	<p>58 A water tank will hold 50 gallons. What flow rate, in gallons per second, is required to fill the tank in 20 seconds?</p> <p>A 0.4 B 2.5 C 16.7 D 70</p>

Sixth grade Problem Types- Algebra & Functions (cont'd)

- 59** A snail is trying to get to the other side of a park. At what rate is the snail traveling?



- A $\frac{1}{2}$ foot per minute
- B 1 foot per minute
- C $1\frac{1}{2}$ feet per minute
- D 2 feet per minute

- 60** Marshall wants to finish typing his English paper before class starts. If he still has 550 words left to type and class starts in 25 minutes, at least how fast must Marshall type to finish his paper on time?

- A 20 words per minute
- B 21 words per minute
- C 22 words per minute
- D 25 words per minute

- 61** Mai earns \$5.50 per hour at her after-school job. How many hours does she have to work to earn \$132?

- A 16
- B 20
- C 24
- D 28

- 62** Jerry read a 200-page book in 10 hours. At that rate, how long will it take him to read a 320-page book?

- A 16 hours
- B 18 hours
- C 24 hours
- D 32 hours

- 63** If a freight train travels at a speed of 20 miles per hour for 6 hours, how far will it travel?

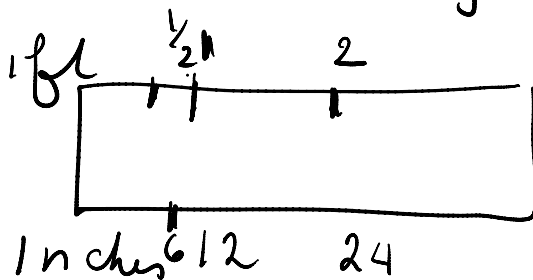
- A 120 miles
- B 80 miles
- C 26 miles
- D 12 miles

51 How many inches are in $2\frac{1}{2}$ feet?

- A 24 inches
- B 25 inches
- C 29 inches
- D 30 inches

Inches, Feet

12 inches = 1 ft



2 ft = 24 inches

$\frac{1}{2}$ ft = 6 inches

2 $\frac{1}{2}$ ft 30 inches

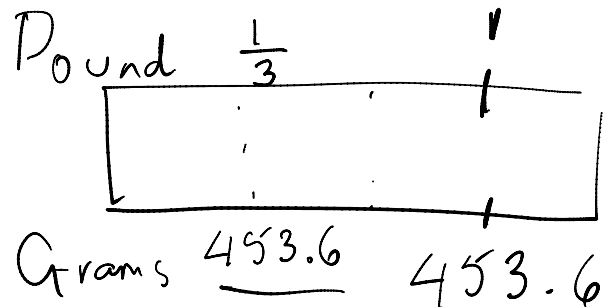
52 Sandra had a recipe that required $\frac{1}{3}$ pound of beef.

Pound Equivalent

1 pound = 453.6 grams

Using the table above, about how many grams of beef does she need?

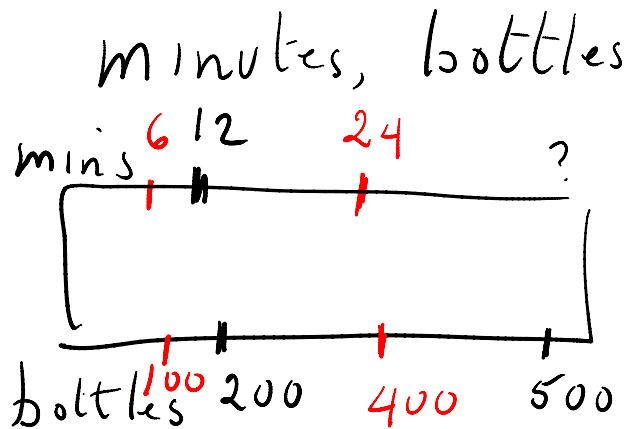
- A 5
- B 151
- C 454
- D 1361



$$\begin{array}{r} 453.6 \\ \times 3 \\ \hline 1360.8 \end{array}$$

- 53 It takes a machine 12 minutes to fill 200 bottles of soda. At this rate, how many minutes will it take the machine to fill 500 bottles of soda?

A 25 minutes
B 28 minutes
C 30 minutes
D 40 minutes



400 bottles = 24 mins

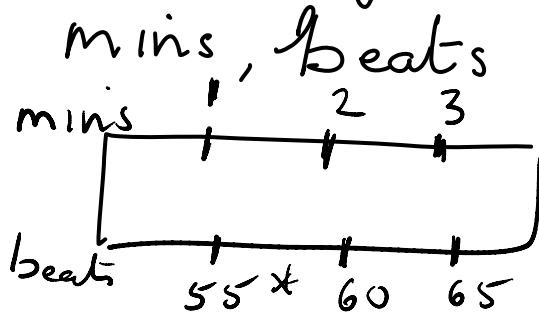
100 bottles = 6 mins

500 bottles = 30 mins

- 54 Trish's resting heart rate is 50 beats per minute. For every minute she exercises, her heart rate increases 5 beats per minute. How long will it take her to reach a heart rate of 120 beats per minute?

A 5 minutes
B 14 minutes
C 34 minutes
D 70 minutes

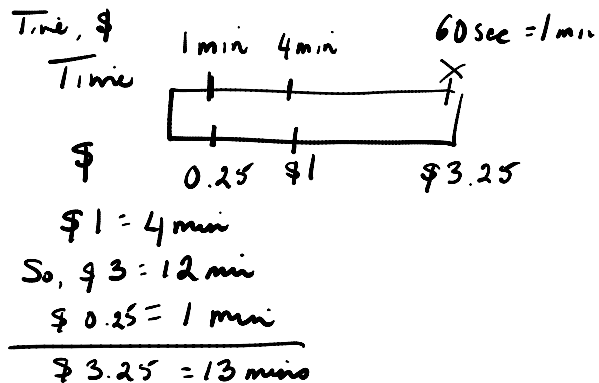
At rest, heart rate = 50 beats per min *



1 min = Rest rate + 5 = 55
4-70 6-80 9-90 11-95
5-75 7-85 10-95 12-100
... 14 mins

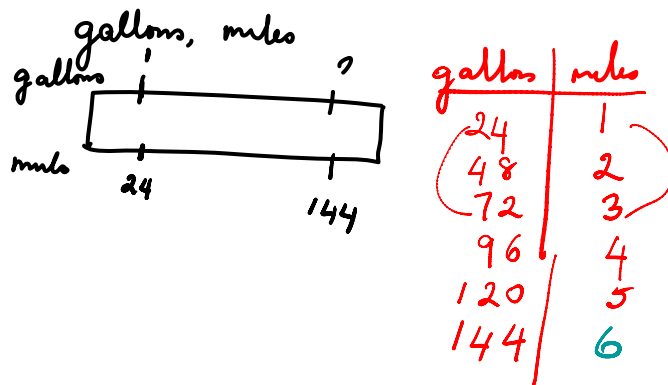
- 55 Marcus spent \$3.25 to wash his car. If one quarter operates the car wash for 60 seconds, how long did it take him to wash his car?

A 10 minutes
B 13 minutes
C 16 minutes
D 32.5 minutes



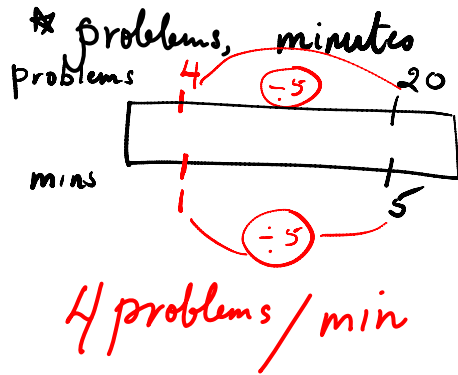
- 56 A car gets 24 miles per gallon of gasoline (mi/gal). How many gallons of gasoline would the car need to travel 144 miles?

A 6.5 gallons
B 6 gallons
C 5.5 gallons
D 5 gallons



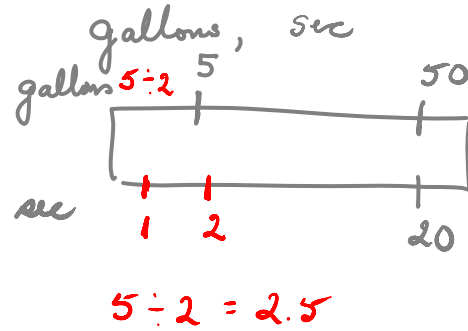
57 Sheila has been given 5 minutes to solve 20 arithmetic problems. What is the minimum rate Sheila can work in order to finish in time?

- A 1 problem per minute
- B 2 problems per minute
- C 4 problems per minute
- D 5 problems per minute

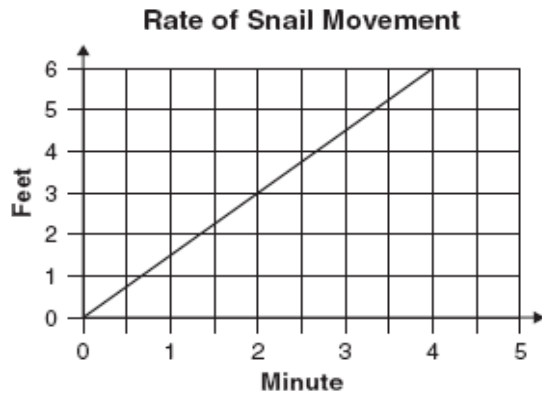


58 A water tank will hold 50 gallons. What flow rate, in gallons per second, is required to fill the tank in 20 seconds?

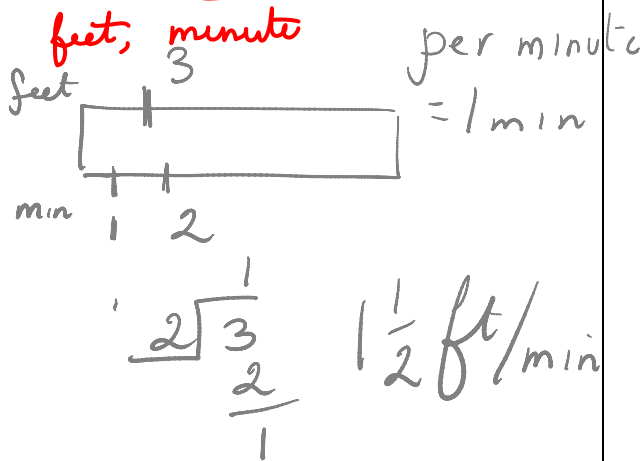
- A 0.4
- B 2.5
- C 16.7
- D 70



- 59 A snail is trying to get to the other side of a park. At what rate is the snail traveling?

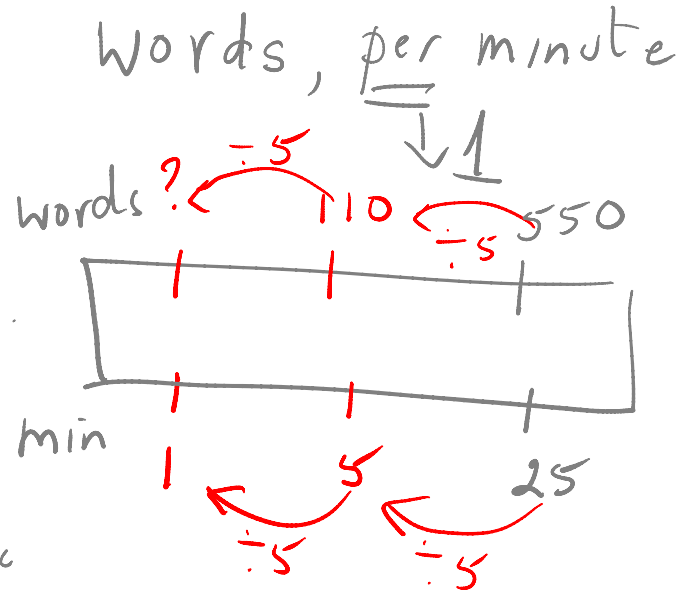


- A $\frac{1}{2}$ foot per minute
 B 1 foot per minute
 C $1\frac{1}{2}$ feet per minute
 D 2 feet per minute



- 60 Marshall wants to finish typing his English paper before class starts. If he still has 550 words left to type and class starts in 25 minutes, at least how fast must Marshall type to finish his paper on time?

- A 20 words per minute
 B 21 words per minute
 C 22 words per minute
 D 25 words per minute



$$110 \div 5 = 22$$

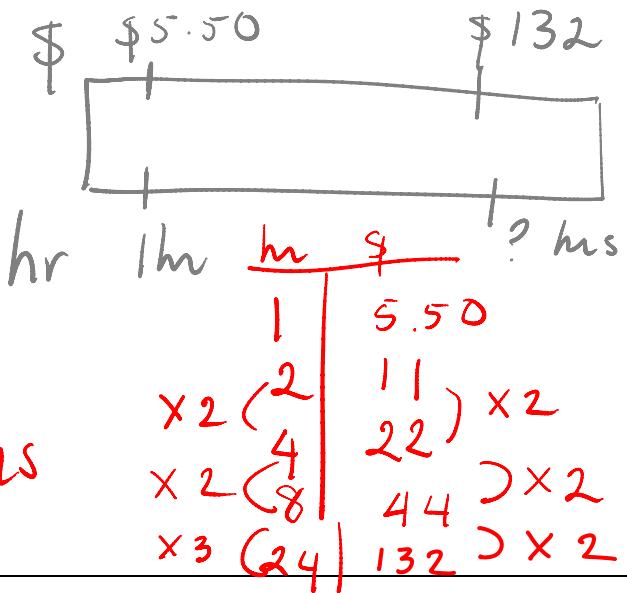
$$\begin{array}{r} 22 \\ 5 \overline{) 110} \\ \underline{10} \\ 10 \\ \underline{10} \end{array} \quad 22 \text{ words/min}$$

- 61 Mai earns \$5.50 per hour at her after-school job. How many hours does she have to work to earn \$132?

A 16
B 20
C 24
D 28

\$, ^{per} hour
↓
hr

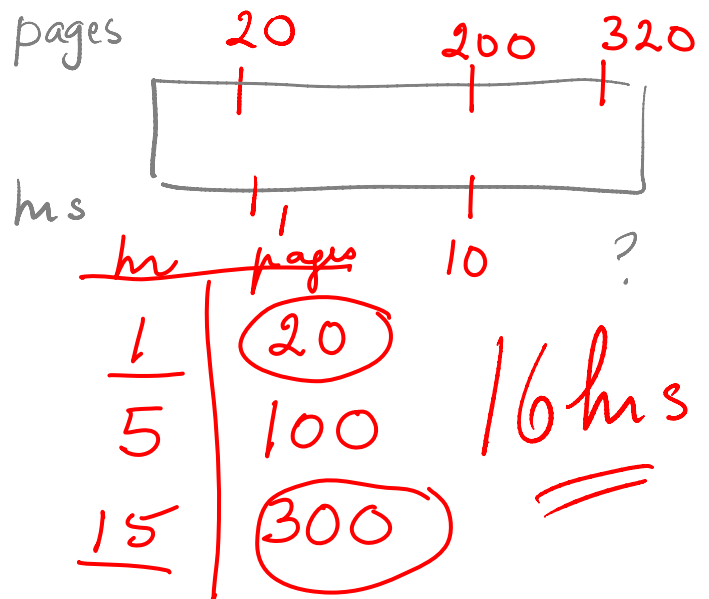
24 hrs



- 62 Jerry read a 200-page book in 10 hours. At that rate, how long will it take him to read a 320-page book?

A 16 hours
B 18 hours
C 24 hours
D 32 hours

pages, hours

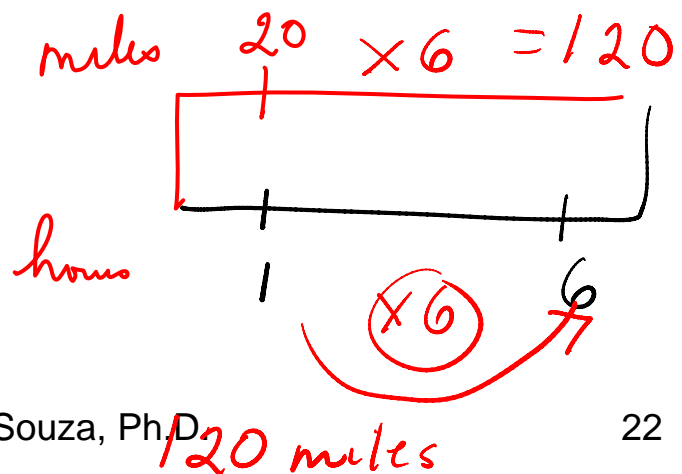


- 63 If a freight train travels at a speed of 20 miles per hour for 6 hours, how far will it travel?

A 120 miles
B 80 miles
C 26 miles
D 12 miles

miles, hours

per hour = 1 hr



Percent Problems

- 13** A sweater originally cost \$37.50. Last week, Moesha bought it at 20% off.



How much was deducted from the original price?

- 14** Jason bought a jacket on sale for 50% off the original price and another 25% off the discounted price. If the jacket originally cost \$88, what was the final sale price that Jason paid for the jacket?
- A \$22
B \$33
C \$44
D \$66

CSM01307

- 15** Marl borrowed \$200 at 12% simple interest for one year. If he makes no payments that year, how much interest will he owe at the end of the year?
- A \$6.00
B \$12.00
C \$22.40
D \$24.00

Grade 7 Questions

- 16** Tamika works in a shoe store and is paid a 12% commission on her sales. In January her sales total was \$3740. To the nearest dollar, how much did Tamika earn in commission for January?

A \$312
B \$449
C \$3291
D \$4189

- 17** Stuart is buying a pair of jeans that regularly cost \$40. They are on sale for 20% off. If the tax rate is 8%, what is the sale price of the jeans including tax?

A \$21.60
B \$34.56
C \$42.34
D \$44.16

- 18** A calculator that is regularly priced \$20 is on sale for 40% off. What is the sale price of the calculator?

A \$8
B \$12
C \$15
D \$16

- 19** The percentage discount at a store is determined using the table below.

Sale Discounts

Total Purchases	Discount
less than \$50	25%
\$50 to \$100	30%
over \$100	35%

Shamika bought 3 skirts that cost \$25 each before the discount. What was her total after the discount?

A \$45.00
B \$48.75
C \$52.50
D \$56.25

Grade 7 Questions

- 20** Mr. and Mrs. Blank sold their house for \$200,000 and needed to hire an attorney to handle the closing procedures. Attorney Mr. Gable charges a flat rate of \$2500. Attorney Ms. Mandel charges $1\frac{1}{2}\%$ of the cost of the house. Which attorney would be cheaper for Mr. and Mrs. Blank to use?
- A Mr. Gable
 - B Ms. Mandel
 - C Their fees would be the same.
 - D cannot be determined from the information given

Rate Problems

- 62** A duck flew at 18 miles per hour for 3 hours, then at 15 miles per hour for 2 hours. How far did the duck fly in all?
- A 69 miles
 - B 75 miles
 - C 81 miles
 - D 84 miles

- 63** Juanita earns \$36 for 3 hours of work. At that rate, how long would she have to work to earn \$720?
- A 12 hours
 - B 20 hours
 - C 60 hours
 - D 140 hours

- 64** The distance a spring stretches varies directly with the force applied to it. If a 7-pound weight stretches a spring a distance of 24.5 inches, how far will the spring stretch if a 12-pound weight is applied?
- A 3.4 inches
 - B 19.5 inches
 - C 42 inches
 - D 294 inches

- 66** Mr. Callaway needs to purchase enough grass seed to cover a 3000-square-foot lawn and a 4200-square-foot lawn. If 40 ounces of grass seed will seed a 2400-square-foot lawn, how many ounces does he need to seed both lawns?
- A 20
 - B 30
 - C 120
 - D 180

- 67** Mr. Ogata drove 276 miles from his house to Los Angeles at an average speed of 62 miles per hour. His trip home took 6.5 hours. How did his speed on the way home compare to his speed on the way to Los Angeles?
- A It was about 2 miles per hour faster.
 - B It was about 2 miles per hour slower.
 - C It was about 20 miles per hour faster.
 - D It was about 20 miles per hour slower.

- 68** The distance that a spring stretches when an object hangs from it varies directly with the weight of the object. If a spring stretches 2 cm when a 50-gram weight is attached to it, what is the weight of an object that stretches the same spring 5 cm?
- A 20 grams
 - B 75 grams
 - C 125 grams
 - D 350 grams

Grade 7 Questions

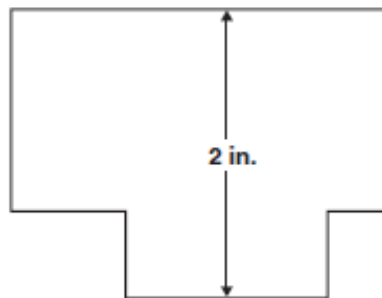
- 69 A train traveled at an average speed of 45 miles per hour for 2 hours and 30 miles per hour for 3 hours. What is the total number of miles that the train traveled?

A 75
B 90
C 180
D 195

- 70 How many millimeters are in 20 centimeters?

A 0.02 millimeters
B 0.2 millimeters
C 200 millimeters
D 20,000 millimeters

- 71 Mr. Craig made a scale drawing of his office.

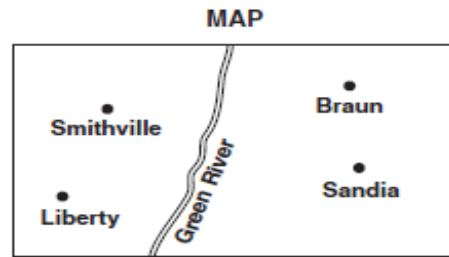


$$\frac{1}{2} \text{ inch} = 3 \text{ feet}$$

The width of the scale drawing of the office is 2 inches. What is the actual width, in feet, of Mr. Craig's office?

A 3
B 6
C 9
D 12

- 72 Mr. Grey is planning to fly an airplane from Smithville straight to Sandia.



Scale: = 40 miles
1 inch

The distance from Smithville to Sandia measures 1.5 inches on the map. What is the actual distance from Smithville to Sandia, in miles?

A 40
B 50
C 60
D 70

- 74 The atmosphere normally exerts a pressure of about 15 pounds per square inch on surfaces at sea level. About how much pressure does the atmosphere exert on a surface 30 square inches in area?

A 2 pounds
B 15 pounds
C 45 pounds
D 450 pounds

- 75 A utility company estimates that a power line repair job will take a total of 24 person-hours. If 3 workers are assigned to the job, how long will it take them to complete the job according to this estimate?

A 8 hours
B 12 hours
C 27 hours
D 72 hours

- 76 Citizens of Honduras use lempira for their money. In July 2002, the conversion rate for U.S. money to Honduran money was about 6 cents to 1 lempira. What dollar amount was equivalent to 300 lempiras?

A \$0.18
B \$0.50
C \$18.00
D \$50.00

Grade 7 -Solutions

- 13 A sweater originally cost \$37.50. Last week, Moesha bought it at 20% off.



How much was deducted from the original price?

- A \$7.50
- B \$17.50
- C \$20.00
- D \$30.00

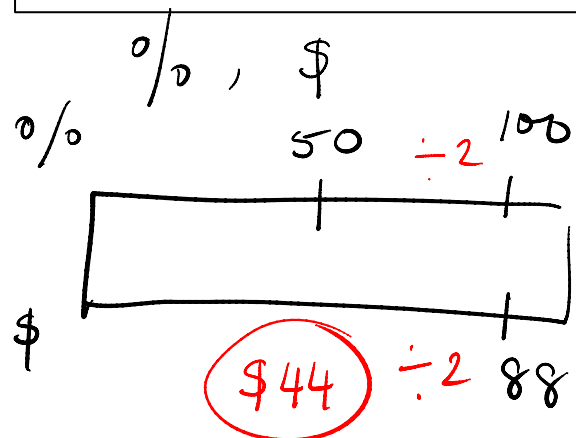
Handwritten solution for Question 13:

100% = \$37.50
 10% = \$3.75
 x 2
 20% = \$7.50

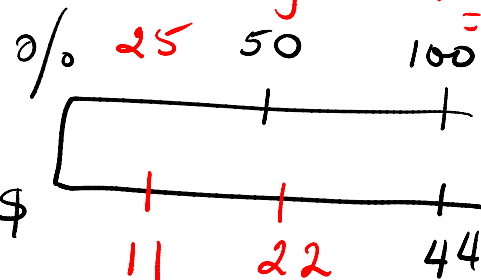
- 14 Jason bought a jacket on sale for 50% off the original price and another 25% off the discounted price. If the jacket originally cost \$88, what was the final sale price that Jason paid for the jacket?

- A \$22
- B \$33
- C \$44
- D \$66

CSMD0307



Discounted price = \$88 - \$44 = \$44

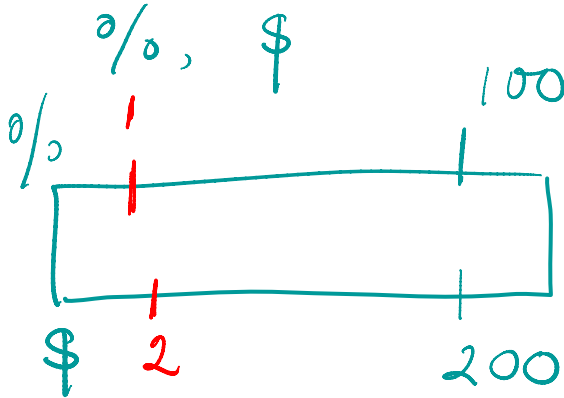


Discount = \$11

Final sale price = \$44 - \$11 = \$33

- 15 Marl borrowed \$200 at 12% simple interest for one year. If he makes no payments that year, how much interest will he owe at the end of the year?

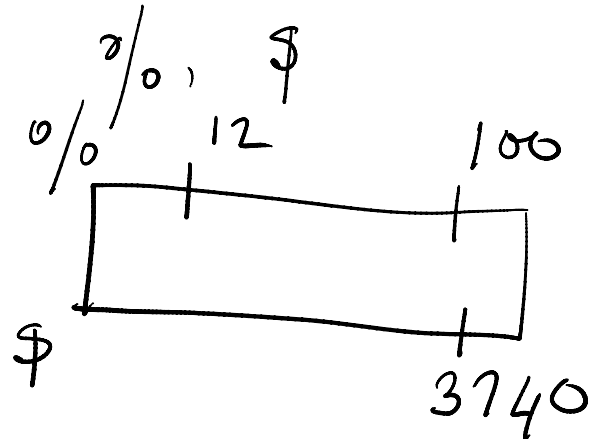
A \$6.00
B \$12.00
C \$22.40
D \$24.00



$$\begin{array}{rcl} 100\% & = & \$200 \\ 1\% & = & \$2 \\ \times 12 & & \times 12 \\ \hline 12\% & = & \$24 \end{array}$$

- 16 Tamika works in a shoe store and is paid a 12% commission on her sales. In January her sales total was \$3740. To the nearest dollar, how much did Tamika earn in commission for January?

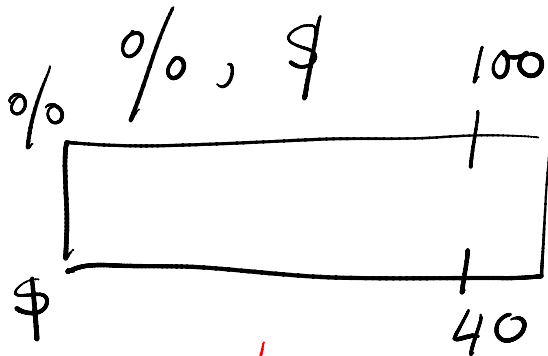
A \$312
B \$449
C \$3291
D \$4189



$$\begin{array}{rcl} 100\% & = & \$3740 \\ 1\% & = & \$37.40 \\ \times 12 & & \times 12 \\ \hline 12\% & = & \$448.80 \\ & \approx & \$449 \end{array}$$

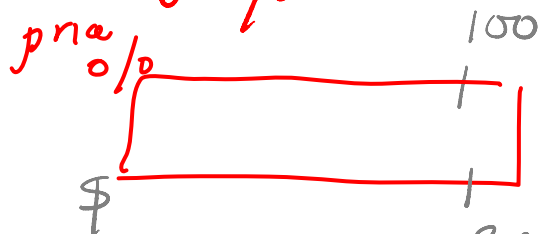
- 17 Stuart is buying a pair of jeans that regularly cost \$40. They are on sale for 20% off. If the tax rate is 8%, what is the sale price of the jeans including tax?

A \$21.60
B \$34.56
C \$42.34
D \$44.16



$$\begin{array}{r} 100\% = \$40 \\ 10\% = \$4 \\ \hline 20\% = \$8 \end{array}$$

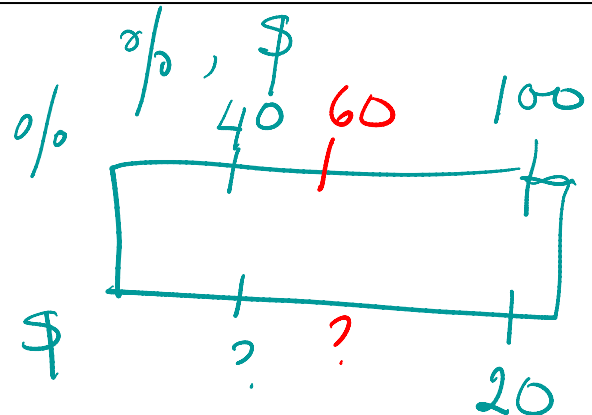
Discounted 80% = \$32



$$\begin{array}{r} 100\% = \$32 \\ 1\% = \$0.32 \\ 8\% = \underline{\$2.56} \quad \text{Tax} \\ \hline \text{Sales price } \$32 \\ \text{Tax } 2.56 \\ \hline \$34.56 \end{array}$$

- 18 A calculator that is regularly priced \$20 is on sale for 40% off. What is the sale price of the calculator?

A \$8
B \$12
C \$15
D \$16



You can find the sales price = 60% directly

$$100\% = \$20$$

$$10\% = \$2$$

$$\begin{array}{r} \times 6 \\ \hline 60\% = \$12 \end{array}$$

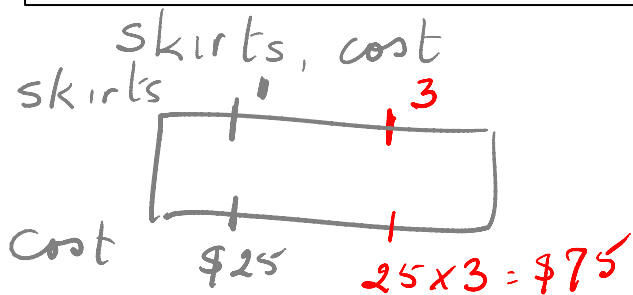
- 19 The percentage discount at a store is determined using the table below.

Sale Discounts

Total Purchases	Discount
less than \$50	25%
\$50 to \$100	30%
over \$100	35%

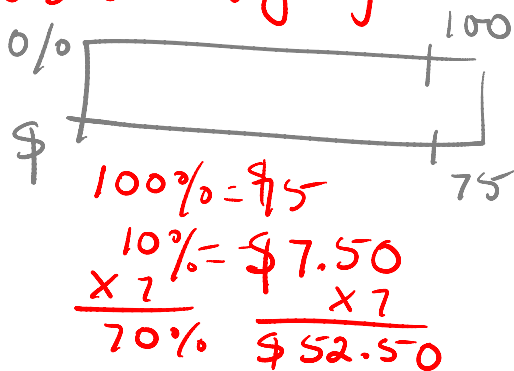
Shamika bought 3 skirts that cost \$25 each before the discount. What was her total after the discount?

- A \$45.00
B \$48.75
C \$52.50
D \$56.25



So discount = 30%

So she will pay = 70%



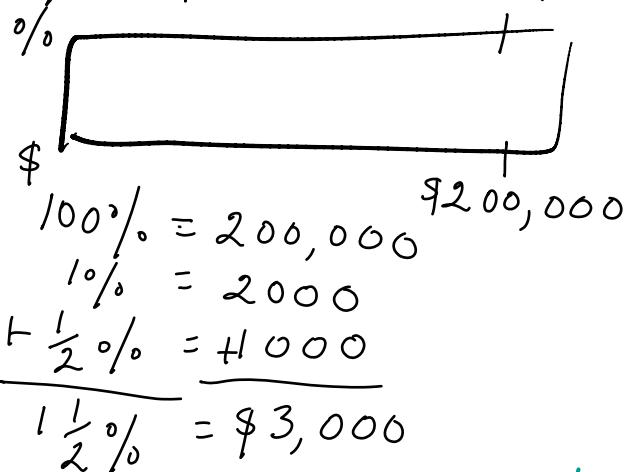
- 20 Mr. and Mrs. Blank sold their house for \$200,000

and needed to hire an attorney to handle the closing procedures. Attorney Mr. Gable charges a flat rate of \$2500. Attorney Ms. Mandel charges $1\frac{1}{2}\%$ of the cost of the house. Which attorney would be cheaper for Mr. and Mrs. Blank to use?

- A Mr. Gable
B Ms. Mandel
C Their fees would be the same.
D cannot be determined from the information given

Mr Gable = \$2,500

Mrs Mandel = $1\frac{1}{2}\%$

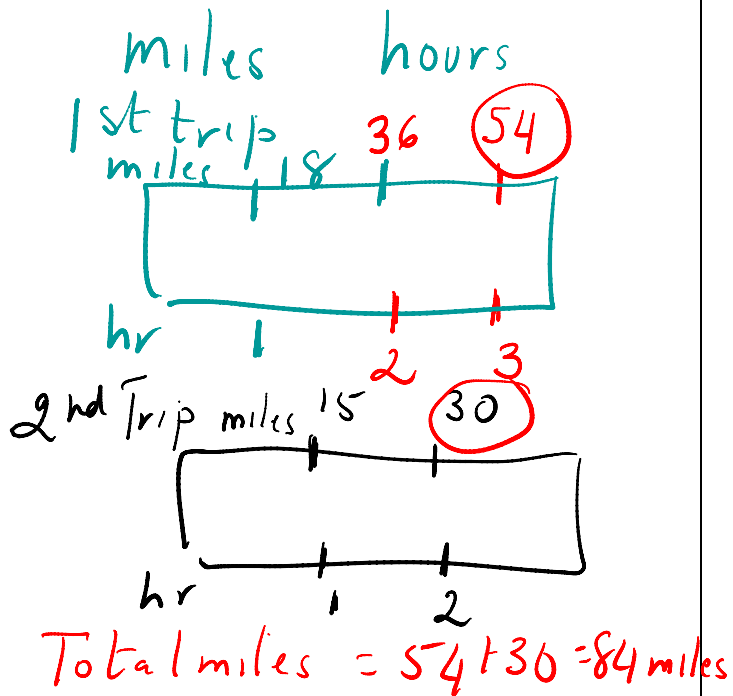


Mr Gable is cheaper!

62 A duck flew at 18 miles per hour for 3 hours, then at 15 miles per hour for 2 hours. How far did the duck fly in all?

- A 69 miles
- B 75 miles
- C 81 miles
- D 84 miles

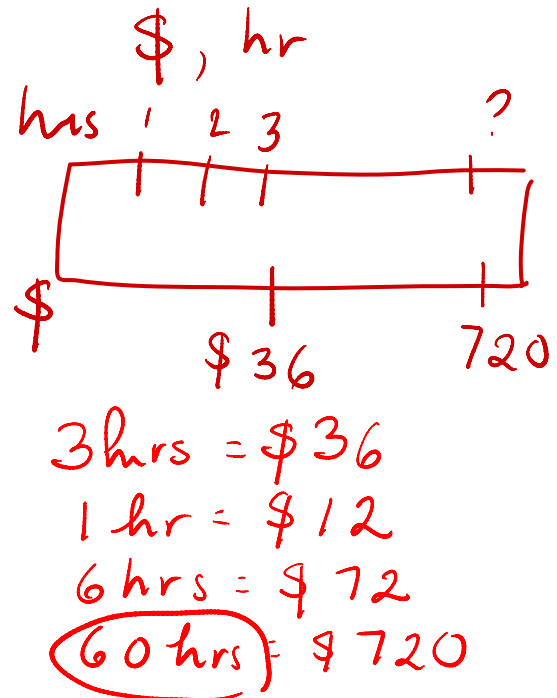
CSM00042



63 Juanita earns \$36 for 3 hours of work. At that rate, how long would she have to work to earn \$720?

- A 12 hours
- B 20 hours
- C 60 hours
- D 140 hours

CSM02316

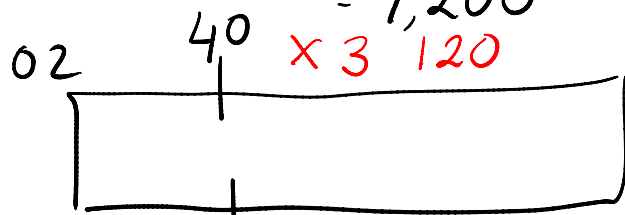


- 66 Mr. Callaway needs to purchase enough grass seed to cover a 3000-square-foot lawn and a 4200-square-foot lawn. If 40 ounces of grass seed will seed a 2400-square-foot lawn, how many ounces does he need to seed both lawns?

A 20
B 30
C 120
D 180

Ounces, sq ft

Total amt of sq feet to be covered = $3,000 + 4,200 = 7,200$



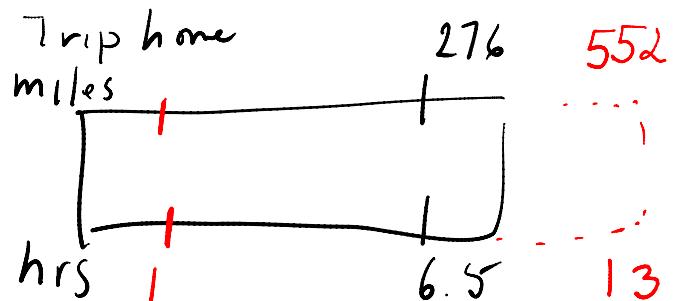
Sq ft 2400 $\times 3 = 7,200$

120 was used by looking at the m. choice answers.

- 67 Mr. Ogata drove 276 miles from his house to Los Angeles at an average speed of 62 miles per hour. His trip home took 6.5 hours. How did his speed on the way home compare to his speed on the way to Los Angeles?

A It was about 2 miles per hour faster.
B It was about 2 miles per hour slower.
C It was about 20 miles per hour faster.
D It was about 20 miles per hour slower.

miles, hrs

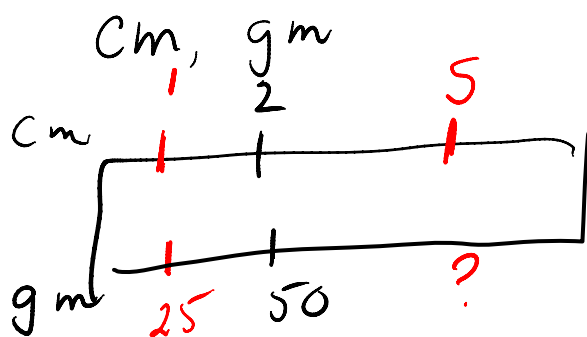


$$\begin{array}{r} 42 \\ 13 \overline{) 552} \\ \underline{52} \\ 32 \\ \underline{26} \end{array}$$

$\approx 42 \text{ mph}$
Trip to LA = 62 mph
Roughly = 20 mph slower

- 68 The distance that a spring stretches when an object hangs from it varies directly with the weight of the object. If a spring stretches 2 cm when a 50-gram weight is attached to it, what is the weight of an object that stretches the same spring 5 cm?

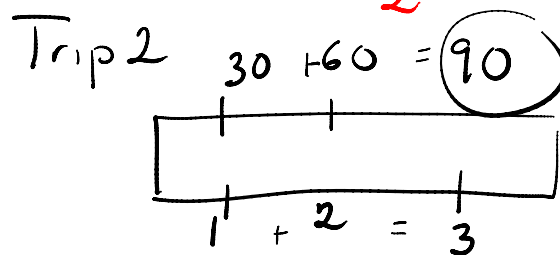
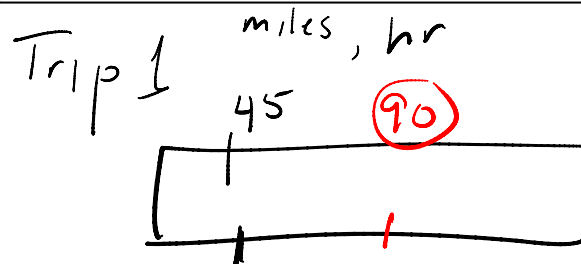
A 20 grams
B 75 grams
C 125 grams
D 350 grams



$$\begin{aligned}
 2 \text{ cm} &= 50 \\
 4 \text{ cm} &= 100 \\
 + 1 \text{ cm} &= 25 \\
 \hline
 5 \text{ cm} &= 125 \text{ gm}
 \end{aligned}$$

- 69 A train traveled at an average speed of 45 miles per hour for 2 hours and 30 miles per hour for 3 hours. What is the total number of miles that the train traveled?

A 75
B 90
C 180
D 195



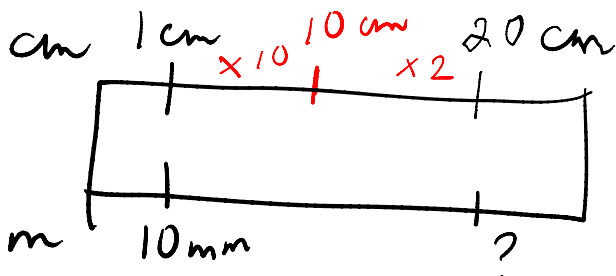
$$\begin{aligned}
 \text{Total miles} &= 90 + 90 \\
 &= 180 \text{ miles}
 \end{aligned}$$

70 How many millimeters are in 20 centimeters?

- A 0.02 millimeters
- B 0.2 millimeters
- C 200 millimeters
- D 20,000 millimeters

mm, cm

We know m dm cm mm
 $1 \text{ cm} = 10 \text{ mm}$

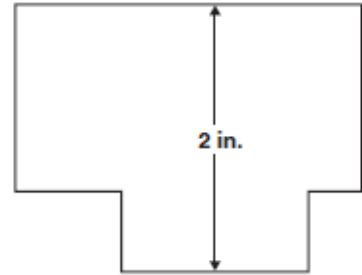


$$1 \text{ cm} = 10 \text{ mm}$$

$$10 \text{ cm} = 100 \text{ mm}$$

$$20 \text{ cm} = 200 \text{ mm}$$

71 Mr. Craig made a scale drawing of his office.

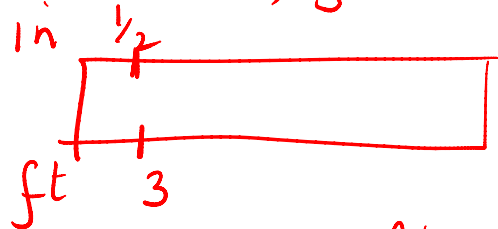


$$\frac{1}{2} \text{ inch} = 3 \text{ feet}$$

The width of the scale drawing of the office is 2 inches. What is the actual width, in feet, of Mr. Craig's office?

- A 3
- B 6
- C 9
- D 12

inches, ft



$$\frac{1}{2} \text{ in} = 3 \text{ ft}$$

$$1 \text{ in} = 6 \text{ ft}$$

$$2 \text{ in} = \underline{12 \text{ ft}}$$

- 72 Mr. Grey is planning to fly an airplane from Smithville straight to Sandia.

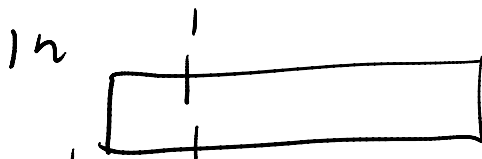


Scale: 1 inch = 40 miles

The distance from Smithville to Sandia measures 1.5 inches on the map. What is the actual distance from Smithville to Sandia, in miles?

- A 40
- B 50
- C 60
- D 70

1 in. = 40 miles



$$\begin{aligned}
 1 \text{ in} &= 40 \text{ miles} \\
 0.5 \text{ in} &= 20 \text{ miles} \\
 1.5 \text{ in} &= 60 \text{ miles}
 \end{aligned}$$

- 74 The atmosphere normally exerts a pressure of about 15 pounds per square inch on surfaces at sea level. About how much pressure does the atmosphere exert on a surface 30 square inches in area?

- A 2 pounds
- B 15 pounds
- C 45 pounds
- D 450 pounds

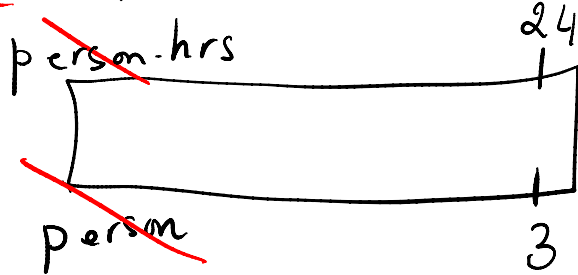
Handwritten work for Question 74:

$$\begin{aligned}
 &1 \text{ in}^2, 1 \text{ lbs} \\
 &1 \text{ in}^2 \quad 1 \times 30 = 30 \\
 &1 \text{ lbs} \quad 15 \times 30 = 450 \text{ in}^2
 \end{aligned}$$

75 A utility company estimates that a power line repair job will take a total of 24 person-hours. If 3 workers are assigned to the job, how long will it take them to complete the job according to this estimate?

- A 8 hours
- B 12 hours
- C 27 hours
- D 72 hours

person - hours, persons

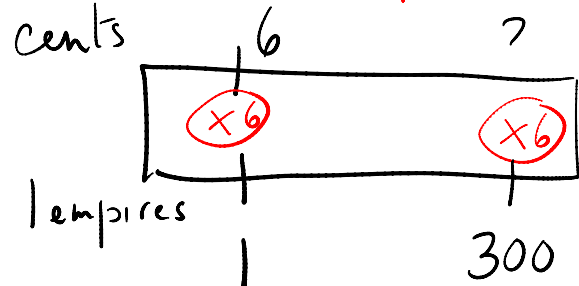


$$\text{hrs} = 24 \div 3 = 8 \text{ hrs}$$

76 Citizens of Honduras use lempira for their money. In July 2002, the conversion rate for U.S. money to Honduran money was about 6 cents to 1 lempira. What dollar amount was equivalent to 300 lempiras?

- A \$0.18
- B \$0.50
- C \$18.00
- D \$50.00

Cents, lempiras



$$300 \times 6 = 1800 \text{ cents}$$

$$1800 \div 100 = \$18$$

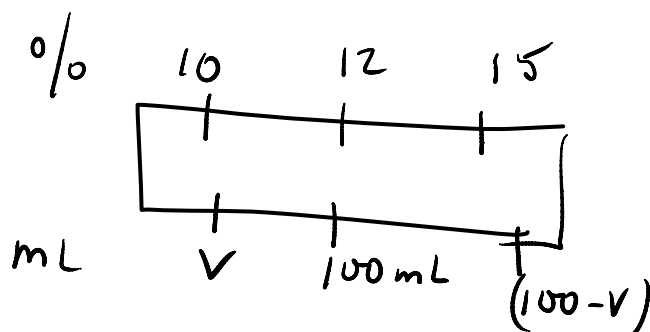
Algebra I

<p>86 A pharmacist mixed some 10%-saline solution with some 15%-saline solution to obtain 100 mL of a 12%-saline solution. How much of the 10%-saline solution did the pharmacist use in the mixture?</p> <p>A 60 mL B 45 mL C 40 mL D 25 mL</p>	<p>88 One pipe can fill a tank in 20 minutes, while another takes 30 minutes to fill the same tank. How long would it take the two pipes together to fill the tank?</p> <p>A 50 min B 25 min C 15 min D 12 min</p>
<p>87 Andy's average driving speed for a 4-hour trip was 45 miles per hour. During the first 3 hours he drove 40 miles per hour. What was his average speed for the last hour of his trip?</p> <p>A 50 miles per hour B 60 miles per hour C 65 miles per hour D 70 miles per hour</p>	<p>90 Lisa will make punch that is 25% fruit juice by adding pure fruit juice to a 2-liter mixture that is 10% pure fruit juice. How many liters of pure fruit juice does she need to add?</p> <p>A 0.4 liter B 0.5 liter C 2 liters D 8 liters</p>
<p>212. Mr. Jacobs can correct 150 quizzes in 50 minutes. His student aide can correct 150 quizzes in 75 minutes. Working together, how many minutes will it take them to correct 150 quizzes?</p> <p>A 30 B 60 C 63 D 125</p>	<p>91. How many liters of 20% alcohol solution should be added to 40 liters of a 50% alcohol solution to make a 30% solution?</p> <p>92. John wants to make a 100 ml of 5% alcohol solution mixing a quantity of a 2% alcohol solution with a 7% alcohol solution. What are the quantities of each of the two solutions (2% and 7%) he has to use?</p>
<p>213. Suppose one painter can paint the entire house in twelve hours, and the second painter takes eight hours. How long would it take the two painters together to paint the house?</p>	<p>93. Sterling Silver is 92.5% pure silver. How many grams of Sterling Silver must be mixed to a 90% Silver alloy to obtain a 500g of a 91% Silver alloy?</p> <p>94. How many Kilograms of Pure water is to be added to 100 Kilograms of a 30% saline solution to make it a 10% saline solution.</p>

- 86 A pharmacist mixed some 10%-saline solution with some 15%-saline solution to obtain 100 mL of a 12%-saline solution. How much of the 10%-saline solution did the pharmacist use in the mixture?

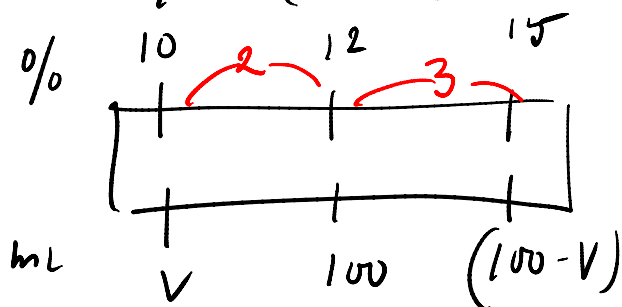
A 60 mL
B 45 mL
C 40 mL
D 25 mL

% , mL



10% is V mL

Then 15% = $(100 - V)$



$$2V = 3(100 - V)$$

$$2V = 300 - 3V$$

$$+3V \quad +3V$$

$$5V = 300$$

$$V = 60 \text{ mL}$$

(c)Ed D'Souza, Ph.D.

- 87 Andy's average driving speed for a 4-hour trip was 45 miles per hour. During the first 3 hours he drove 40 miles per hour. What was his average speed for the last hour of his trip?

A 50 miles per hour
B 60 miles per hour
C 65 miles per hour
D 70 miles per hour

miles, hrs

$$\text{miles } 45 \text{ (x4)} = 180 \text{ miles}$$



$$\text{hr } 1 \text{ (x4)} \quad 4$$

$$\text{miles } 40 \text{ (x3)} = 120$$



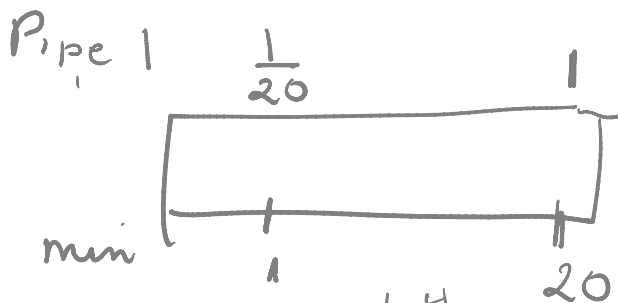
$$\text{hr } 1 \quad 3$$

Last hour he travels
60 miles

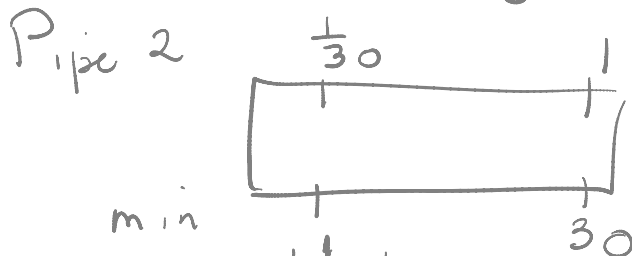
- 88 One pipe can fill a tank in 20 minutes, while another takes 30 minutes to fill the same tank. How long would it take the two pipes together to fill the tank?

A 50 min
B 25 min
C 15 min
D 12 min

Whole tank = 1

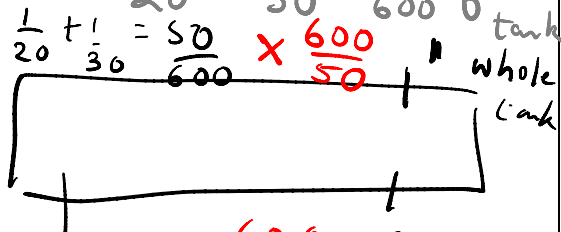


In 1 min = $\frac{1}{20}$ th tank is filled



In 1 min = $\frac{1}{30}$ th of the tank filled

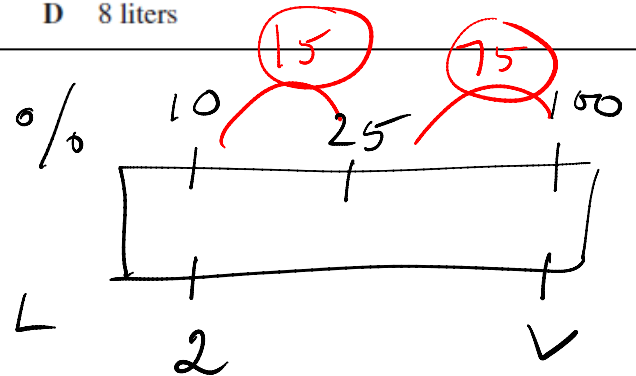
Together they will fill in
1 min = $\frac{1}{20} + \frac{1}{30} = \frac{50}{600}$ of the tank



$\frac{600}{50} = 12 \text{ mins}$

- 90 Lisa will make punch that is 25% fruit juice by adding pure fruit juice to a 2-liter mixture that is 10% pure fruit juice. How many liters of pure fruit juice does she need to add?

A 0.4 liter
B 0.5 liter
C 2 liters
D 8 liters



$$2 \times 15 = 75 \checkmark$$

$$75 \checkmark = 30$$

$$\checkmark = \frac{30}{75} = \frac{6}{15} = \frac{2}{5}$$

$$= 0.4 \text{ L}$$







